Broadband Repeater

TX Series

GSM / DCS / PCS / CDMA / WCDMA

User Manual

About This Manual

This user's manual is produced for use of Coiler TX Series by Coiler personnel, licensees, and customers.

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Coiler

Coiler is a leading supplier of wireless solutions that enable mobile voice and data communication and wireless Internet access throughout any facility. The company's EQ Series provides mobile users with highly reliable access high quality voice and wireless data via cellular networks throughout any private (corporation, university, hospital) or public (airport, convention center, subway) facility.

Coiler EQ Series supports all global wireless access standards including GSM900, DCS1800, CDMA and iDEN. Coiler also offers a full range of professional services to ensure cost effective and timely deployment of wireless networks.

Your comments can assist us in improving our products and documentation. Please address them to Taiwan Coiler International Corp.

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Abbreviations

Abbreviation	Meaning
AGC	Automatic Gain Control
BTS	Base Transceiver Station
MS	Mobile Station
UL	Uplink
DL	Downlink
GSM	Global System for Mobile Communications
CDMA	Code Division Multiple Access
UMTS	Universal Mobile Telecommunications System
W-CDMA	Wideband Code Division Multiple Access
LNA	Low Noise Amplifier
PA	Power Amplifier
PSU	Power Supply Unit
RF	Radio Frequency

1. Safety

Any personnel involved in installation, operation or service of the Coiler TX Series must understand and obey the following:

1. Coiler TX Series is designed to receive and amplify signals from one or more base stations and retransmit the signals to one or more mobile station. Also, the repeater is designed to receive signals from one or more mobile stations, amplify and retransmit to the base stations. The repeater must be used exclusively for these purposes and nothing else.

2. Coiler TX Series supplied from the mains must be connected to grounded outlets and in conformity with any local regulations.

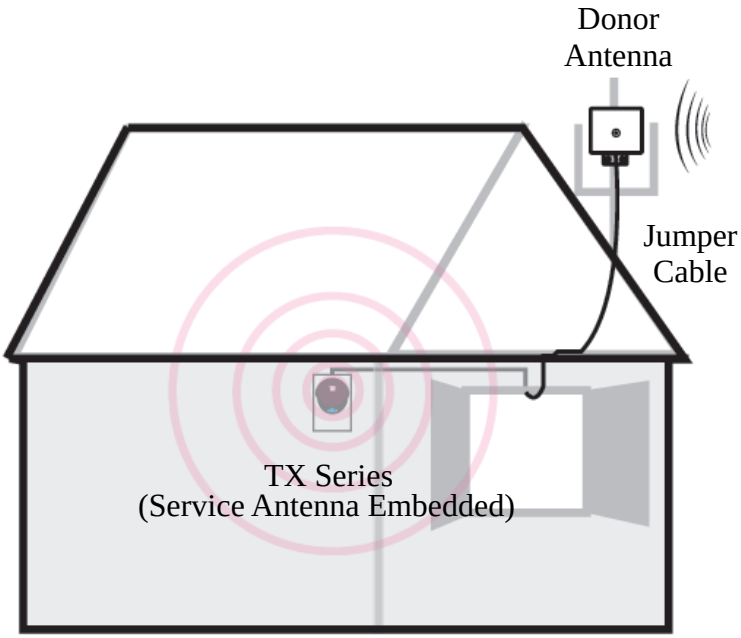
3. The power supply unit in repeaters supplied from the mains contains dangerous voltage level, which can cause electric shock. Switch the mains off prior to any work in such a repeater. Any local regulations are to be followed when servicing a repeater. Authorized service personnel only are allowed to service the repeater while the main is switched on.

4. When working on a repeater on high ground, be careful not to drop parts or the entire repeater. Falling parts can cause serious personal injury.

5. Any repeater, including this repeater, will generate radio signals and thereby give rise to electromagnetic fields that may be hazardous to the health of any person who is extensively exposed to the signals at the immediate proximity of the repeater and the repeater antennas.

2. Introduction

Coiler TX Series is a very useful equipment that can provide highly reliable, high quality mobile communications in cellular network. Especially, it is used to fill out uncovered areas in cellular mobile system, such as base station fringe areas, business and industrial buildings, etc.



This one-person-one-phone capability gives user the ability to use their cellular phone in any location throughout the enterprise and beyond. Seamless coverage lets phone users roam freely between buildings as well as indoors and outdoors without changing phones.

A repeater receives signals from a base station, amplifies and retransmits the signals to mobile stations. Also it receives, amplifies and retransmits signals in the opposite direction. Both directions are served simultaneously.

To be able to receive and transmit signals in both directions, the repeater is connected to a donor antenna directed towards the base station and to a service antenna directed towards the area

needs to be covered.

3. Repeater Types

Coiler TX Series has the following series:

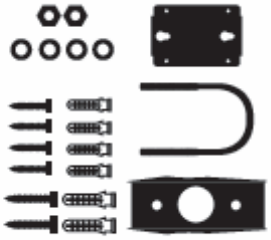
- GSM 900
- DCS 1800
- PCS 1900
- CDMA 800
- UMTS 2200 (W-CDMA)

The Coiler TX Repeater System is designed to improve cell phone signal coverage and enhance reception in the indoor areas where mobile signal is limited or compromised due to construction structures or natural obstacles.
The TX Repeater System has been optimized to provide cellular signal coverage and improve voice quality and service range in areas up to 250 square meters of empty space. It is perfect for the installation in homes, offices, conference rooms and shops.
Coiler TX Repeater System with Panel Antenna is designed for use in areas where adequate mobile signal is available on the roof or side of the building.

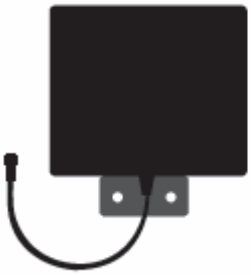
4. Installation

Before installation, please read Chapter 1 '**Safety'** closely.
Check the package contents to make sure everything is included inside. Please contact the dealer if any part is missing.

Main Repeater Unit with Integrated Indoor Antenna



Mounting Kit



Donor Antenna

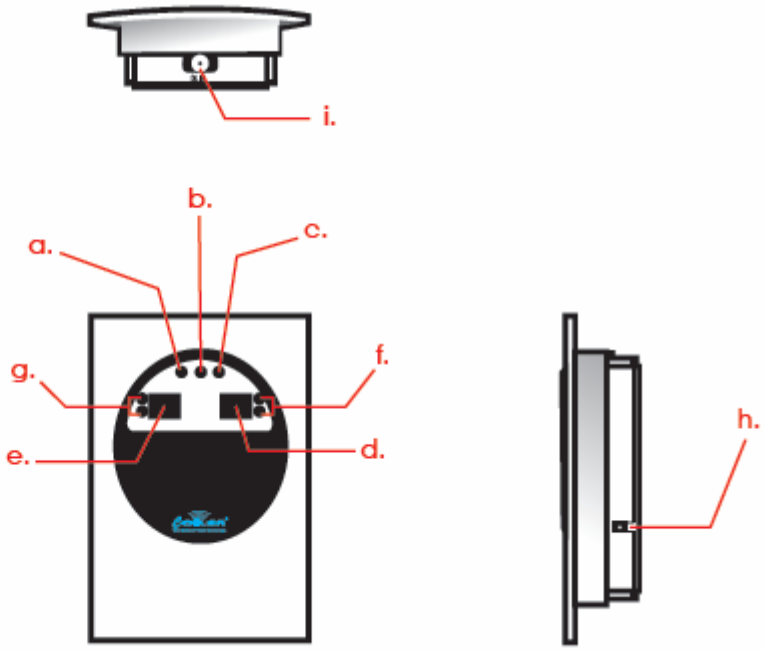
Power Supply Adaptor

Coaxial Cable (10m)

4.1 Repeater Parts Identification

The detailed information about each part of the TX Series is as the figure below.

a. Power LED
b. Downlink (DL) Alarm LED
c. Uplink (UL) Alarm LED
d. DL Gain Display
e. UL Gain Display
f. DL Gain Adjustment Buttons
g. UL Gain Adjustment Buttons
h. DC 8V Plug
i. SMA Cable Connector



The Specification of the AC Adapter:

INPUT: 100~240VAC, 0.5A, 50~60Hz

OUTPUT: 8VDC, 2A

To prevent the device from damage, please make sure that the power supply available in the installation location meets the specification above.

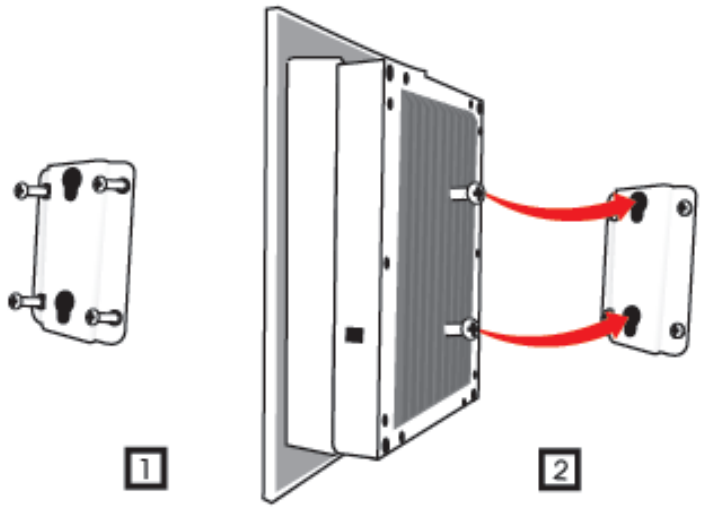
4.2 Sitting the Repeater

Coiler TX Series is designed for **indoor usage only**. However, humidity and temperature changes may have some affect on reliability. A preferable site for the repeater is in a tempered and ventilated room.

For the best performance the repeater should be installed on the wall at least 2 meters from the floor and make sure that AC power plug is available near to the repeater unit. The repeater should be ideally placed centrally to the area requiring coverage.

Make sure that the distance between the repeater unit and the donor antenna is at least 5 meters. Remember that the length of the cable is 10 meters, so make sure you have reserved enough cable to connect the donor antenna and the repeater unit.

Use mounting kit to fasten the main unit bracket first. Place the main unit on the bracket.



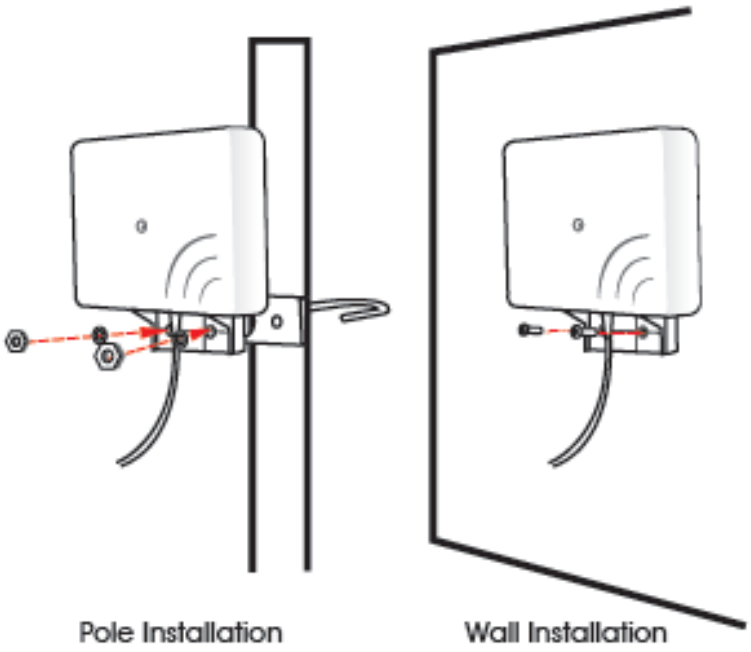
4.3 Donor Antenna Mounting

Please refer to the figure below. It is easy to mount the donor antenna using the provided mounting accessories shown below. The donor antenna should be mounted on the roof of the house where the signal power level is well.

The antenna may be mounted on an existing TV antenna pole or a wall. You may need to reposition or rotate the donor antenna to find the direction providing the strongest signal strength.

To achieve the best performance, we suggest a donor installation position with the signal power level. Ideally the donor antenna should face the nearest Base Station.

A perfect location should have outdoor signal strength greater than -80 dBm (full signal bar on a mobile phone).



4.4 Connection

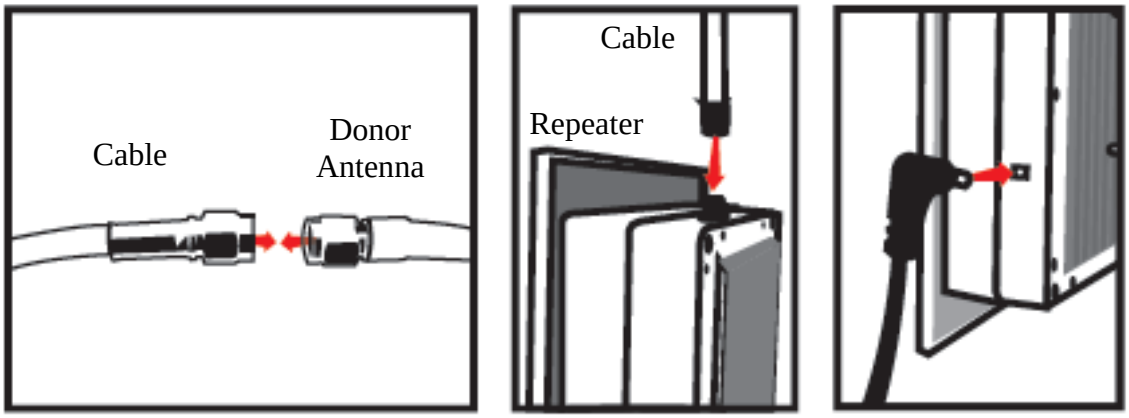
SMA female connectors are used in the repeater. There is no need to install the service antenna (MS) which has been embedded inside the repeater unit.

1. Route the cable between the donor antenna and the repeater unit. Connect the cable to the connector marked SMA on the repeater.

2. Connect the other end to the donor antenna. Make sure that all the connections are tightly fastened.

3. Connect the power cord to the repeater where marked as 'DC in'.

4. **DO NOT** connect the AC Adapter to a power source (such as wall socket) for now.



5. Commissioning

Read carefully Chapter 1 **Safety** before commissioning the repeater.

Check all connectors are connected correctly during the installation. Also, ensure that AC Adapter is connected to a power source such as a wall socket.

When the installation is checked, commission the repeater as described below.

5.1 Starting the Repeater

1. Connect the power cable of the adaptor to the main unit where marked DC 8V and plug the adaptor into the power plug.

2. The power indicator LED should be green and the LED displays will initially show the model number and after 2 seconds it will display the current uplink and downlink gain of the repeater.

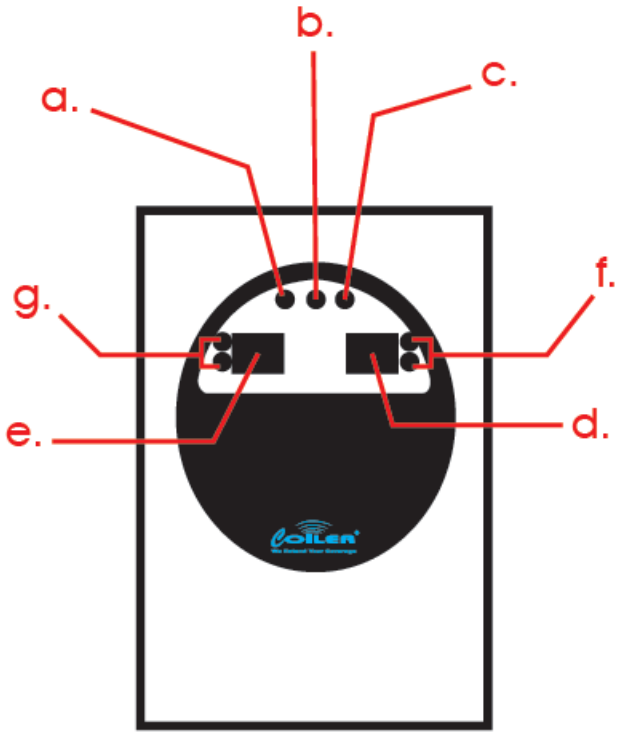
3. Default gain of the repeater is set for maximum values. In case of restarting the units, gain will be set for the last configured value.

4. Make sure that no other LED is illuminated. If any other LED is lit, see Troubleshooting.

5. The TX Repeater System is now ready to work.

5.3 UL/DL Gain Adjustment

In order to meet environment requirement, Coiler TX Series provides UP/DW switch individually to control Uplink/Downlink gain. The UP/DW gain control range is from 40 to 50 dB by 1dB step.



f. DL gain adjustment buttons
g. UL gain adjustment buttons

(Please refer to the 4.1)

You can adjust the uplink (UL) and downlink (DL) gain by pushing the correspondent button (please use a needle).

6. Functional Description

Coiler TX Series works as bi-directional amplifiers. A repeater receives, amplifies, and retransmits signals downlink and uplink simultaneously, i.e. from the base station via the repeater to the mobile stations and from the mobile stations via the repeater to the base station.

The repeater is connected to a donor antenna, directed towards the base station, and to a service antenna directed towards the area to be covered. The service antenna is connected directly to the repeater with the SMB female connector inside the housing. So it is convenient for user to install given this delicate design.

UL/DL Alarm LED, Power LED, and 7-segment displays of UL/DL gain are visible on the repeater front:

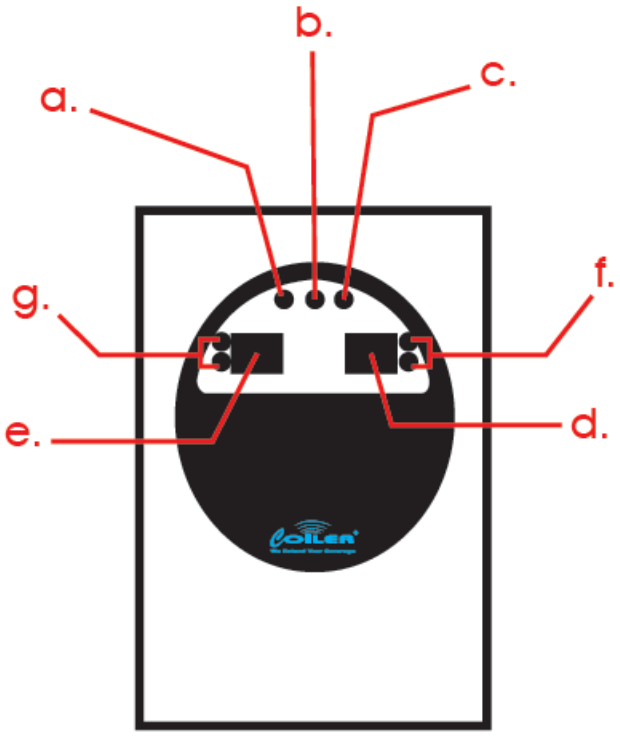
Power – If it shows green light, it means the DC power is working normally.

UL PW – If it shows red light, it means the UL saturation.

DL PW – If it shows red light, it means the DL saturation.

UL gain display – It shows the current uplink gain.

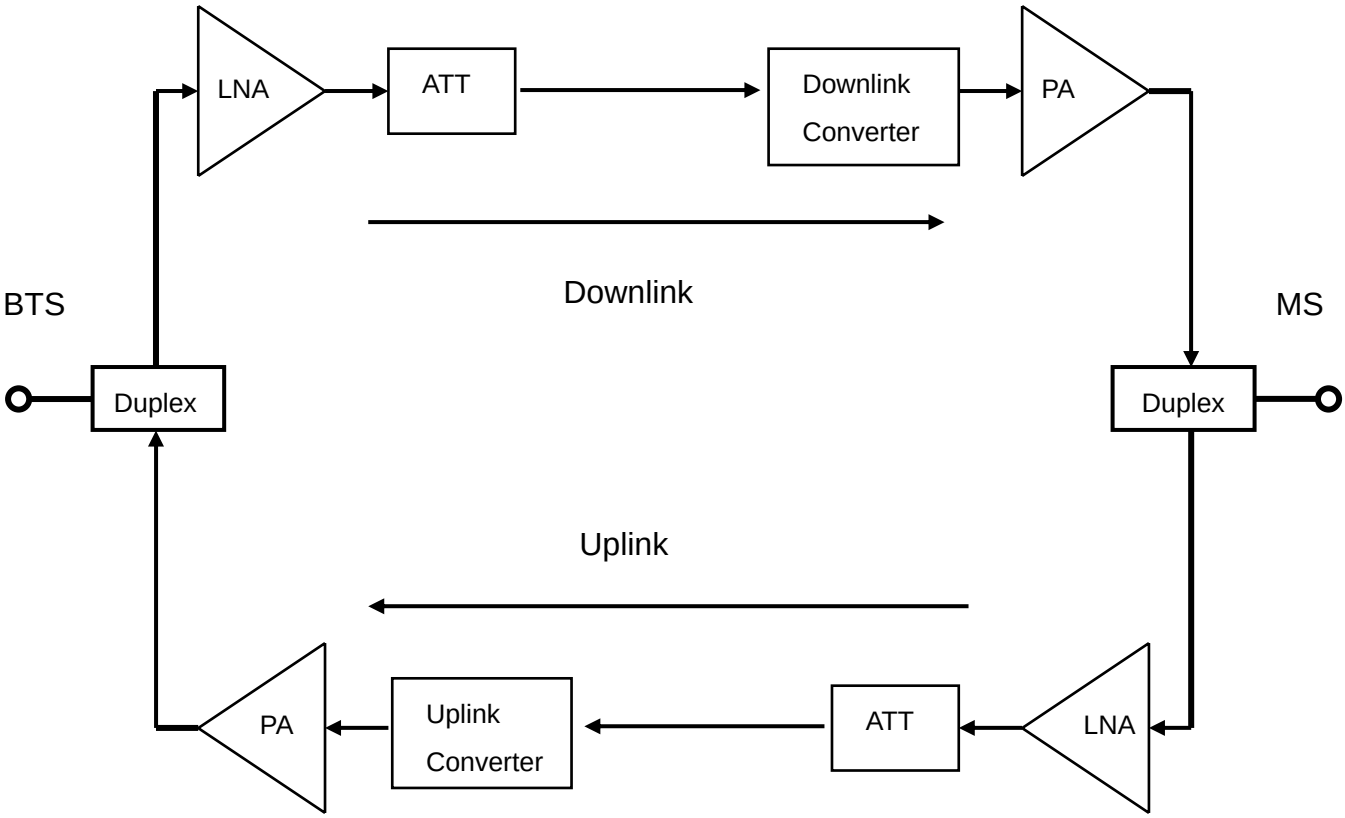
DL gain display – It shows the current downlink gain.



a. Power LED
b. DL alarm LED
c. UL alarm LED
d. DL gain value
e. UL gain value

(Please refer to the 4.1)

6.1 Block Diagram



Block Diagram of TX Series

Figure above shows a block diagram of Coiler TX Series. The diagram is applicable to repeaters for the GSM900, DCS1800, PCS1900, CDMA800 and UMTS2200.

For Downlink path

The signal from the base station is received via the repeater BTS antenna. The signal passes a duplex filter, is amplified in a low noise amplifier (LNA), then passes to the DW attenuator. The downlink signal will be shaped by Downlink Converter, after that is amplified in a power amplifier (PA).

For Uplink path

The signal from the mobile station is received via the repeater MS antenna. The signal passes a duplex filter, is amplified in a low noise amplifier (LNA), then passes to the UP attenuator. The uplink signal will be shaped by Uplink Converter, after that is amplified in a power amplifier (PA).

6.2 Alarm

Coiler TX Series provides LED to distinguish the repeater is working fine or not.

UL/DL Alarm LED:

UL Alarm LED – If it shows red light, it means the UL saturation. This may happen when the isolation of the donor antenna and the service antenna embedded in the repeater is insufficient.

DL Alarm LED – If it shows red light, it means the DL saturation. This may happen when the user is making a call beside the service antenna embedded in the repeater.

For the solution to the alarms above, please see ‘Trouble Shooting’.

7. Repeater Application

7.1 Installation Attention

1. Choosing GSM900 Repeater needs to go with the accessories in GSM900 band. In the same way, choosing DCS1800 Repeater needs to go with the accessories in DCS1800 band.

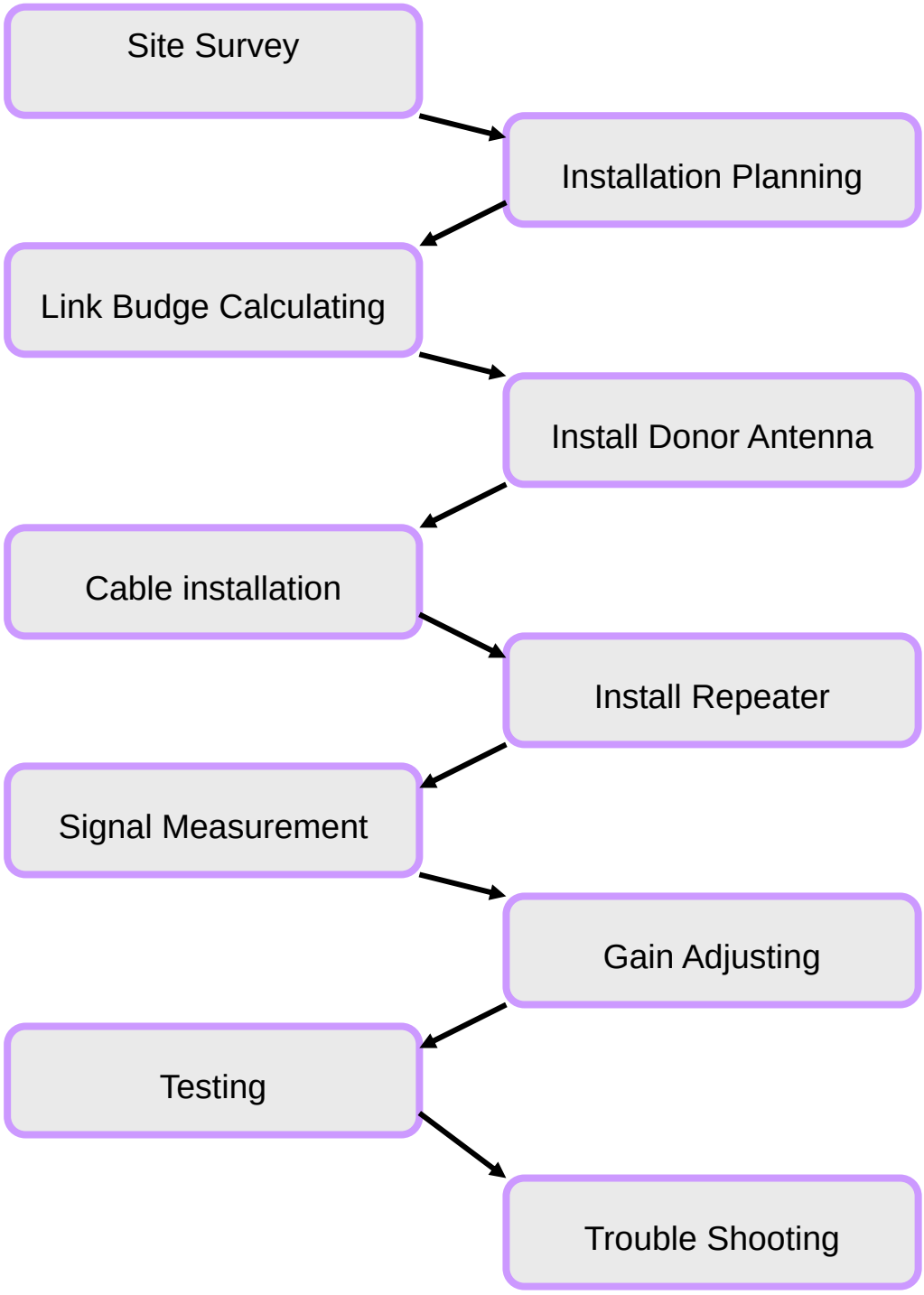
2. The signal strength from donor antenna directly affects the indoor coverage of the repeater. It is important to choose the location to install the donor antenna.

3. In order to avoid oscillation in repeater, we need an isolation which is the repeater gain plus 15dB. For example, if the repeater gain is 50dB, then we need 65dB isolation between donor antenna and service antenna.

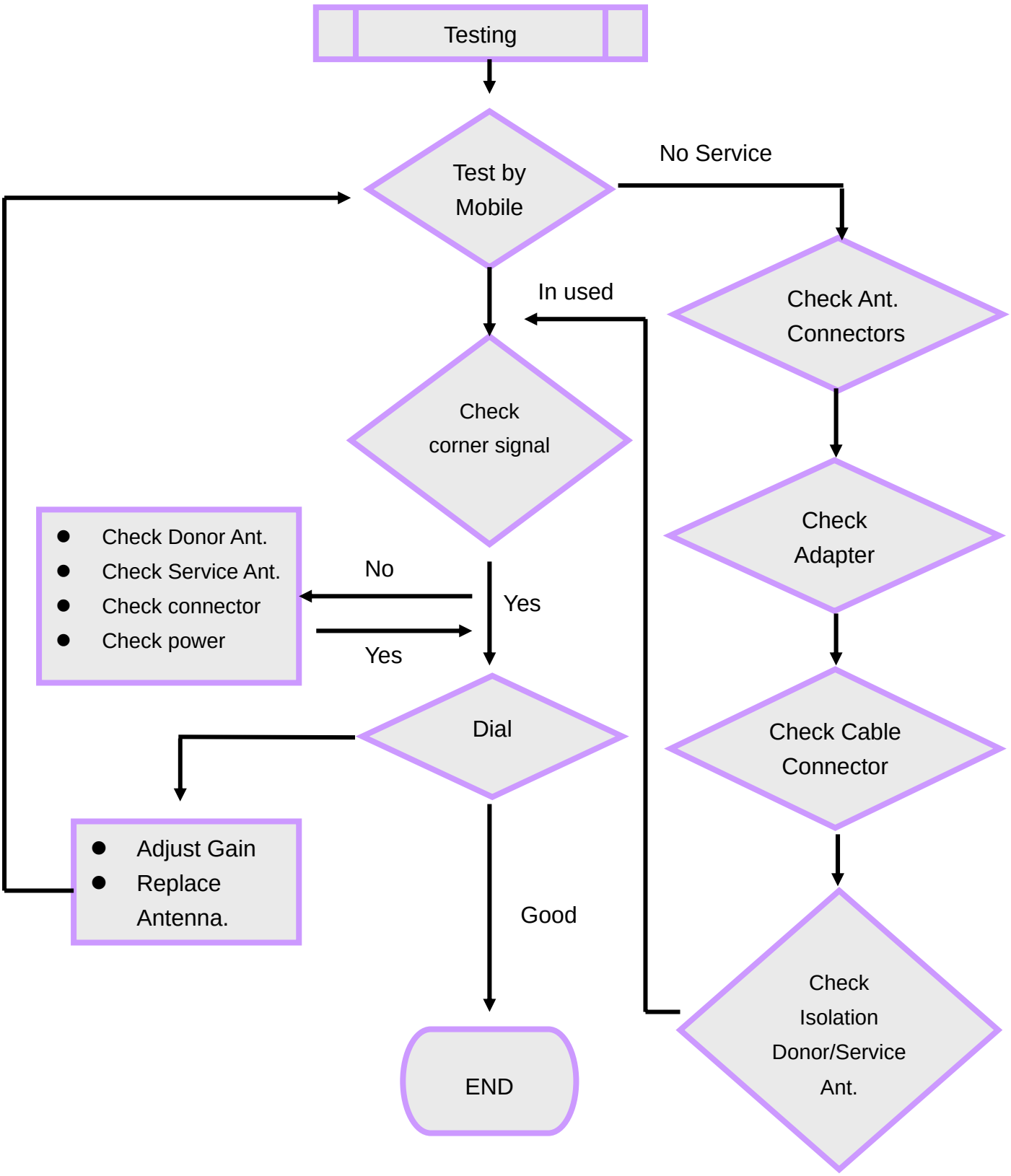
4. For the best performance, signal level of the donor antenna should be greater than -80dBm, and less than +10dBm.

5. Calculating the link budget before installing the repeater. Use the outdoor signal, donor antenna gain, coaxial cable loss, service antenna gain and coverage area to decide the best gain that the repeater should be adjusted.

7.2 Installation Procedure



7.3 Testing


Testing
Test by Mobile
No Service
Check Ant. Connectors
In used
Check corner signal
Check Adapter
Check Donor Ant.
Check Service Ant.
Check connector
Check power
No
Yes
Yes
Dial
Check Cable Connector
Adjust Gain
Replace Antenna.
Good
Check Isolation Donor/Service Ant.
END

7.4 Trouble Shooting

Q1. Why is still no signal after installing the equipment?
Answer:
1. Check the output power of Adapter is DC 8V or not.
2. Check the connector of donor antenna is tight or not.
3. Check the connectors of coaxial cable are tight or not.
4. Check the outdoor signal is strong enough or not.
5. Check the connector of service antenna is tight or not.

Q2. Why the signal strength is too weak on the corner?
Answer:
1. Check the outdoor signal is greater than -80dBm.
2. Check repeater is full gain or not.
3. Check all of the connectors are tight.
4. Check the output power of Adapter is DC13.5V or not.
5. Change the location of donor/service antenna.
6. Check the cable type is suitable or not.
7. Add the service antenna on the corner.

Q3. Why can not make a call after installation, even thought you can detect the downlink signal?
Answer:
1. Check the isolation between donor antenna and service antenna is enough or not.
2. Change the location of donor/service antenna.
3. Reduce the repeater gain.

Q4. The signal is not stable after turning on the repeater power?
Answer:
1. Check the outdoor signal is stable or not.
2. Check the isolation between donor antenna and service antenna is enough or not.
3. Check the antennas are good or not.

4. Check the coaxial cable is broken or not.

Q5. The DL red LED illuminated.
Answer:
The DL Red LED will be illuminated in a situation when the distance between the main TX unit and a donor antenna is not sufficient.

Coiler recommends that the distance between the two is no less than 5 meters. If the situation occurs, please increase the distance between the donor antenna and the main TX unit or reduce the DL gain by pushing the down button (please use a needle) of the DL gain until the LED stops blinking.

In a typical situation, DL alarm may only occur during the initial installation, but not during the regular use. In case that the isolation has not been increased for an extended period of time, the TX Repeater System will auto shut down.

Q6. The UL red LED illuminated.
Answer:
The UL Red LED will be illuminated in a situation when the distance between the main TX unit and a mobile phone is not sufficient.

Coiler recommends that the distance between the two is no less than 1 meter. If the situation occurs, please increase the distance between your mobile phone and the main TX unit or reduce the UL gain by pushing the down button (please use a needle) of the UL gain until the LED stops blinking.

In a situation when UL isolation is not sufficient, the repeater will be functional; however the call quality may decrease.

Auto Shut Down ASD and Auto Turn On ATO

The TX Repeater System features DL Auto Shut Down (ASD) function to protect

equipment and mobile network from damage in case the input power signal level exceeds a prescribed limit. This may happen if the signal from a nearby base station is too strong or if the operator has changed configuration of the mobile network (e.g. by setting up a mobile base station in a nearby area). The situation is usually temporary. ASD will temporarily disable the amplifier and trigger the DL alarm LED. Auto Turn On function will automatically determine, every 15 seconds, if the signal level has dropped to the normal level and reactivate the functions of the repeater. The ATO will repeat the process 3 times (after then it will require manual restart). ASD may be also triggered if isolation between the donor antenna and the repeater unit has been insufficient for an extended period of time (please see Automatic Isolation Detection above.)

Coiler recommends returning the fault equipment, once above condition is checked step by step.

FCC Regulations:

●This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

●This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiated radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user‘s authority to operate the equipment.

FCC RF Exposure Requirements:

CAUTION:
The antenna (s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Mobile Devices:
-The Donor antennas used for this transmitter must not exceed an antenna gain of 9 dBi.
-A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR 2.1091.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.